

### 5.5 Transformation of the Sine Function

#### Transformation of the Sine Function

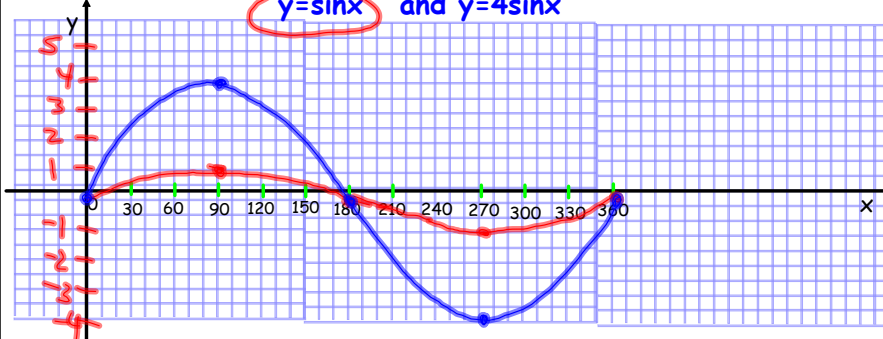
Recall  $y = \sin x$

Key points:  $(0^\circ, 0)$   $(90^\circ, 1)$   $(180^\circ, 0)$   $(270^\circ, -1)$   $(360^\circ, 0)$

Extra Points:  $(30^\circ, 0.5)$   $(150^\circ, 0.5)$   $(210^\circ, -0.5)$   $(330^\circ, -0.5)$

Ex 1: Graph the following functions for one full cycle on the same grid:

$y = \sin x$  and  $y = 4\sin x$



Compare the following functions by looking at the following characteristics:

$y = \sin x$

- a) period  $360^\circ$   
 b) max  $1$   
 c) min  $-1$   
 d) equation of the axis:  
 $y = 0$   
 e) amplitude  $1$

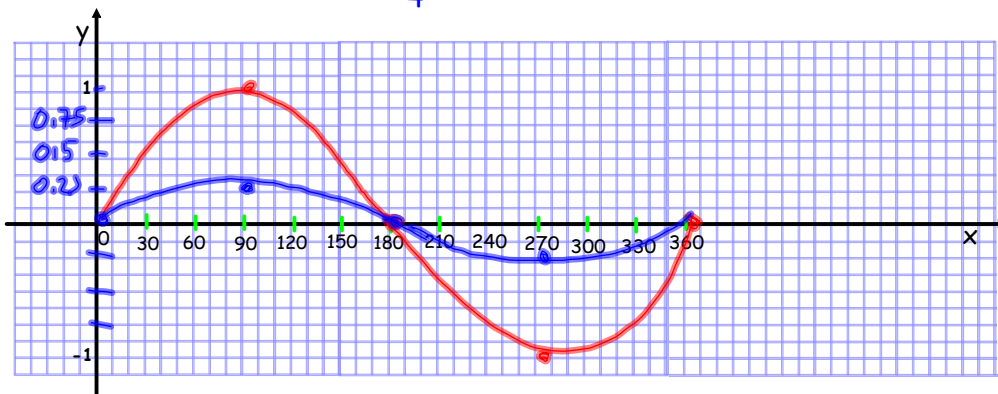
$y = 4\sin x$

- a) period  $360^\circ$   
 b) max  $4$   
 c) min  $-4$   
 d) equation of the axis:  
 $y = 0$   
 e) amplitude  $4$

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Ex 2: Graph the following functions, for one full cycle, on the same grid:

$y = \sin x$  and  $y = \frac{1}{4}\sin x$



Compare the following functions by looking at the following characteristics:

$y = \sin x$

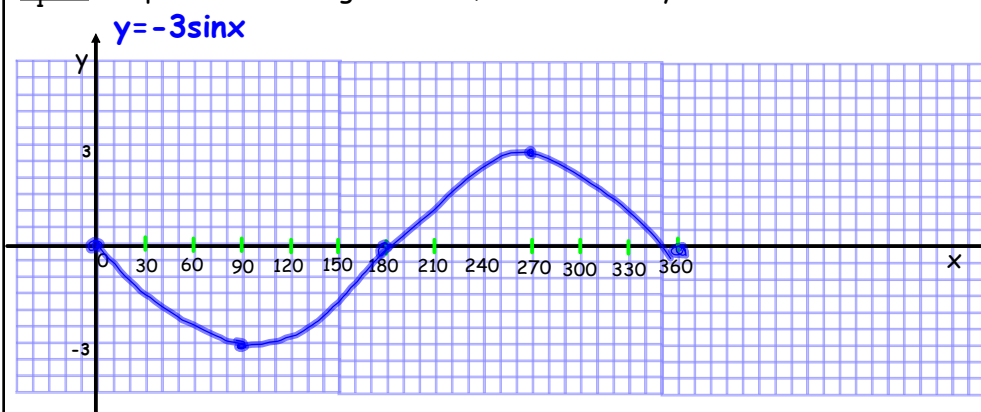
- a) period  $360^\circ$   
 b) max  $1$   
 c) min  $-1$   
 d) equation of the axis:  
 $y = 0$   
 e) amplitude  $1$

$y = \frac{1}{4}\sin x$

- a) period  $360^\circ$   
 b) max  $0.25$   
 c) min  $-0.25$   
 d) equation of the axis:  
 $y = 0$   
 e) amplitude  $0.25$

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Ex 3: Graph the following function, for one full cycle:



List the characteristics:

$y = -3\sin x$

- a) period  $360^\circ$       b) max  $3$   
 c) min  $-3$       d) equation of the axis:  $y = 0$   
 e) amplitude  $3$

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### Putting it all together:

Ex 4: Describe the following transformations and graph the functions:

a)  $y = \sin(x - 30^\circ) + 1$

1. horizontal shift right  $30^\circ$
2. vertical shift up 1

b)  $y = 2\sin(x + 45^\circ) - 1$

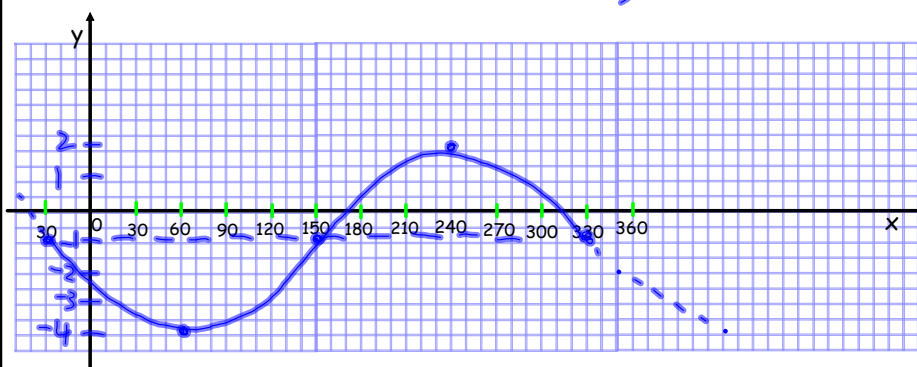
1. vertical stretch by a factor of 2
2. horizontal shift left by  $45^\circ$
3. vertical shift down by 1

In General:

$$y = a \sin[k(x - c^\circ)] + d$$

Amplitude  $\rightarrow a$   
 Period  $\frac{360}{k}$   
 horizontal shift left or right  $\rightarrow c^\circ$   
 vertical shift up or down  $\rightarrow d$

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Ex 5: Graph  $y = -3\sin(x+30^\circ) - 1$ 

List the characteristics:

D =  $\{x \in \mathbb{R}\}$

R =  $\{y \mid -4 \leq y \leq 2, y \in \mathbb{R}\}$

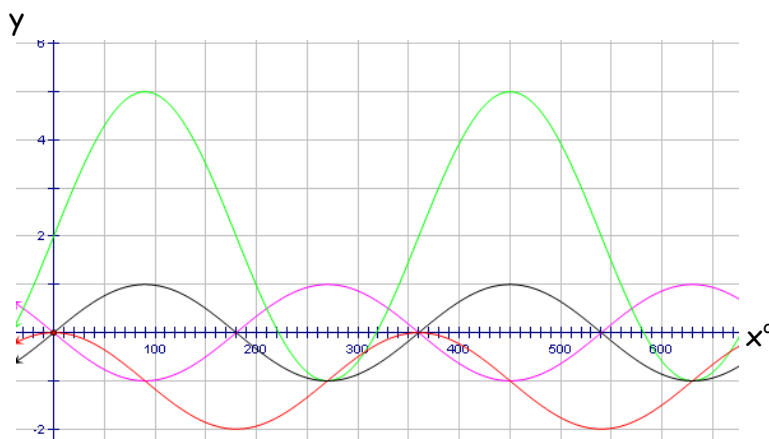
a) period 360b) max 2c) min -4

d) equation of the axis:

$y = -1$

e) amplitude 3

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Ex 6: Find the equations of each graph:

black:  $y = \sin x$ pink:  $y = -\sin x$ red:  $y = -\sin(x - 90) - 1$  OR  $y = \sin(x + 90) - 1$ green:  $y = 3 \sin x + 2$ 

Assigned Work: p 373

#4, 5 cf, 6ab, 7, 8, 13, 15, 16, 17

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unwind unit and transformwaves.GSP